On a new application of the Magnetic Telegraph.

Lieut. Maury gave an account of Dr. Locke's clock at the National Observatory, and said the use of it had suggested the idea of determining, by means of the electro-chronograph, the figure and density of the earth, the height of mountains, and differences in the density of the interior strata between the centre and surface of the earth at different places.

Professor Keith, one of the assistants at the Observatory, had, by means of two globules of mercury to each, converted two other clocks (viz: the west sidereal and the mean time clock) also into electro-chronographs. The index or a pointer to the pendulum passed through a globule of mercury at the lowest part of the arc of each vibration, and while this pointer was in transit through this globule, the circuit was complete, and the recording pen made a dot on the registering surface, which, in this case, was a fillet of paper moving at the rate of half an inch a second between two rollers, as in the case of a common Morse Register, which is generally seen in telegraph offices.

The other globule was placed in the upper part of the clock, and so situated that a little metallic pin attached to the axis of the second wheel would pass through this globule at every sixtieth second. As the circuit through this globule was the shorter, the fluid, abandoning the long one through the pendulum, would take the shorter route back, and the recording pen would thus omit to make a dot at the completion of every minute.

The registering apparatus has five pens in a row, each of which is worked by a circuit of its own, and they are so arranged that if each one of the five were to make a dot at the same instant, we should see a row of five dots across the fillet of paper and at right angles to the plane of its length.

If we suppose the mean time and sidereal clocks each to run with a rate equal to 0s.0, and their pens each in connection with the register, we shall find that the pen of the sidereal clock will make 366 dots, while that of the mean time clock is making 365 *nearly;* so that if the fillet of paper move under the pen at the rate of an inch per second, the distance between the dots of the two pens at a given second will differ from the distance between them the next second the 365th part of an inch nearly.

Lieut. Maury exhibited fillets of paper on which the two clocks

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had been made to dot seconds until there was a gain of a second between them. The dots were made upon parallel lines running as closely to each other as lines can conveniently be drawn on paper. He suggested that, in order accurately to ascertain the difference of these two clocks, it was not necessary that the fillet of paper should actually move through equal spaces during every second of time, or during the whole period of a second, but that the motion should be uniform through almost infinitely small spaces, as through the 365th part of a second for instance.

Suppose, for the sake of illustration, that the sidereal clock completes its gain of a second on the mean time clock exactly at the instant of making the 365th dot of one, and the 366th dot of the other, then the interval on the fillet between the 364th dot of the one and the 365th dot of the other should be equal to the interval between the 366th dot of the one, and the 367th dot of the other. The difference between these two pairs of dots he proposed to measure by means of a powerful microscope, with a micrometer attached, observing that space could be multiplied with much more accuracy optically, than it can mechanically. Thus, suppose the microscope used should magnify but 365 times, the 365th part of an inch would then appear through the microscope as an inch to the naked eye, which part might be readily subdivided optically into hundredths, and thus give us the means of measuring with considerable accuracy the 36500 part of a second.

With such refinement in the recording and sub-division of time, the Lieutenant said, that if two experimental pendulums, nearly duplicates of each other, were freely suspended and vibrated, the one in New-Orleans, and the other near the same meridian, on the borders of the great American Lakes, for instance; and if these pendulums were further so arranged as to make and break circuit, so as to record their vibrations in Washington, with the standard clock of the National Observatory, and if, after these vibrations had been continued till one pendulum had gained a vibration upon the other, the two pendulums were reversed and vibrated for a like period; that is, if the New-Orleans pendulum were removed to the Lake Station, and that of the Lakes removed to New-Orleans, and both vibrated as before, we should, theoretically, at least, have afforded to us rare facilities for determining an arc of the meridian.

If, now, the two pendulums were placed on the same parallel of latitude, one on the Atlantic, and the other in the Mississippi valley,

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for instance, and vibrated, reversed and vibrated as before, the data would be complete, *theoretically* speaking, for determining both figure and density.

Again, if one pendulum were vibrated on the mountains crossed by Magnetic Telegraph, under such circumstances as to make dots on the same fillet with another vibrating on the sea shore, or at a known elevation above tide water, we should, by reversing these pendulums, and vibrating as before, have again, theoretically, the data for determining the difference between the distance of the two stations from the centre of the earth, or in other words, the height of the mountain.

Nay, if we suppose the Magnetic Telegraph to be extended to the West Coast of America—California for instance—and if two pendulumns, one on the Pacific, the other on the Atlantic, be vibrated, reversed, vibrated and recorded as before, through electro-chronograph, we shall have the arguments for determining the difference of level between the two oceans, or the difference in density between the strata, which are interposed between the centre and the circumference, on the Atlantic, and the centre and circumference on the Pacific Coast.

The influence of the moon is also felt by the free pendulum, and if the pendulum were vibrated for a given time when the influence of the moon was a maximum, and again, when it was a minimum, and in such a manner as to record its vibrations through electro-chronograph, we should derive the elements for determining the mass of the moon.

Theoretically, all this was true. The Pendulum would have different times of vibrations under all these circumstances, and would tremble to the influence of each one of these several agents, but whether the experiment could be so refined in practice as to detect the influence of these several agents, is another matter, and one as to which the Lieutenant did not, at present, intend to express an opinion.

Suffice it to say, should the means of observation be so refined as to detect such very small quantities, the wires of the Magnetic Telegraph would then become, in the hands of the Astronomer, as a tentacle, with which he may feel the centre of the earth, as a gauge with which he may measure the difference of density in its strata, and as a balance with which he may weigh the moon, and measure atmospheric accumulations.

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The Director of the National Observatory further remarked that the experimeuts which he had already made in Washington, encouraged him to hope that the electro-chronographic clock might be used, not only to drive the machinery of the registering apparatus, but to drive the clock-work of the equatorial also. If by such means a certain smooth and uniform rate of motion could be obtained for telescopes equatorially mounted, practical astronomers would regard it as an improvement of much value and importance.

Prof. GIBBES observed, that during a journey last summer, through the mountainous region of Georgia, the chief object kept in view was the selection of some peak, proper for the repetition of MASKELYNE'S experiment for determining the density of the earth. Though no mountain was seen which presented in combination the conditions regarded as necessary in isolation, size, and sufficient regularity of figure and structure to permit survey and computation of its mass, yet Stone Mountain in DeKalb County, Georgia, offers some advantages, which, perhaps, adapt it for the kind of observations alluded to in Lieut. MAURY'S paper. It is completely isolated, no peak of similar height, or even in any degree approaching it, being within thirty or forty miles; it is completely bare of trees, except along the western ascent, and a few clumps, where soil has accumulated about loose masses of rock; it is homogeneous in structure, consisting entirely of a fine-grained granite, approaching gneiss in appearance. It is easily accessible for survey, on all sides, and of tolerably regular sub-hemispherical shape; pendulums at the summit and base, or on the opposite sides of the base, could, with but little difficulty, be brought into galvanic connection by wire. The chief defect, and it must be acknowledged that it is a great one, is want of mass, the summit being only 630 feet above the base. A rough survey and subsequent calculation might determine whether the amount of effect on the pendulum would render the experiment worth the trial. About 1200 or 1500 feet of wire would be sufficient to connect the pendulums, at summit and base, and 4000 probably more than enough to connect them, when on opposite sides of the base.

Prof. GIBBES also remarked, that the coincidence at intervals of the beats of a solar and of a sidereal chronometer, would enable us to deduce a result not directly connected with the present subject, but of sufficient interest to be mentioned here, particularly as he had never seen it remarked, though, doubtless, it must have occurred to others.

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As 365 solar days are equal to about 366 sidereal days, the seconds must bear the same ratio, and if the time-keepers beat seconds, the sidereal one will gain on the solar one 1-366th of a second at each beat, and coincidences must occur at intervals of about 366 seconds, or every 6 min. 36 sec.; if the time-keepers beat half-seconds, at every 3 min. 18 sec. As the beats of the chronometers approach coincidence, the intervals between them diminishes until at a particular instant, this interval becomes inappreciable to the ear, and the coincidence appears complete. But it is only apparent, for it will last for several seconds, depending on the delicacy of the ear; and the middle of this interval of duration of apparent coincidence, is to be taken as the most probable instant of true coincidence. In his own case, this interval was 6 seconds, or at the least 5 seconds. Taking the half of the larger of these intervals, it appears that for 3 seconds before and after true coincidence, the interval between the beats is too small to be appreciable to the ear, and as in 3 seconds the sidereal chronometer gains 3-366ths or about 1-120th of a second, it follows, that the smallest interval that can be perceived by the ear, between blows, such as those given by the teeth of the balance wheel, on the pallets of the escapement, is the 1-120th of a second. The ear of others may perhaps be more delicate in this respect.

The sixth paper read, was

On the existence in some individuals of two Insensible Spots on the Retina, by Prof. LEWIS R. GIBBES, *of College of Charleston, (S. C.)*

IN 1668, EDME MARIOTTE, of the Academy of Sciences of Paris, pointed out the remarkable fact that rays of light falling on a particular portion of the bottom of the eye, in its normal state, do not produce the usual visual impressions. This spot, insensible to visual impressions, is always found on the inner or nasal side of the axis of vision, and, in the opinion of MARIOTTE, coincided with the point at which the optic nerve entered the eye. This has never been contested, I believe, nor do I now propose doing so, but I do not know that any one, from MARIOTTE'S time to the present, has called attention to the fact of the existence of other insensible spots of a similar character, and as one of my own eyes, the right, presents this peculiarity, I desire to bring the facts before the Association.

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